

LBNL SAFETY REVIEW COMMITTEE

**Triennial Review of
Management of Environment, Safety, and Health**

Nuclear Science Division

July 2004

Edward Lampo, Team Leader
Engineering Division

Richard Kadel
Physics Division

Othon Monteiro
Accelerator and Fusion Research Division

Otis N. Wong
Office of Assessment and Assurance

LBNL Safety Review Committee
Triennial Review of
Management of Environment, Safety, and Health (MESH)
Nuclear Science Division
July 2004

A. Executive Summary

The Nuclear Science Division has an excellent record for performing work safely. The Division has no recordable injuries or lost workdays, no ORPS reports for unusual or abnormal ES&H events, and no waste management nonconformance or QA exception reports. The NSD safety coordinator and safety committees are proactive in addressing ES&H issues, resulting in comprehensive hazard reviews, regular workplace inspections, and division personnel fully trained in ES&H policies and procedures. Issues identified in this review for improvement include: (1) a more systematic approach in evaluating and resolving the Division's ergonomic risks; (2) ensuring that equipment and storage cabinets are seismically braced in all Division work areas; (3) adherence to requirements for NSD projects under Radiation Work Authorizations; and (4) tracking and closing out Division actions to correct safety deficiencies.

B. Introduction: Description of the Appraisal Process

The purpose of the Management of Environment, Safety, and Health (MESH) appraisal is to 1) review and document the Environment Safety & Health Management System established by the Nuclear Science Division, 2) to analyze the effectiveness of this system, and 3) to bring to the attention of the Berkeley Lab's Safety Review Committee (SRC) any noteworthy practices, observations, or concerns.

The appraisal process consisted of three steps: 1) a review of the ES&H documentation provided by Nuclear Science and the EH&S Divisions, 2) a meeting between the MESH appraisal team and the Division Director and the Division's ES&H Coordinator, followed by 3) a field inspection of selected Nuclear Science facilities. The MESH appraisal team consisted of Edward Lampo, team leader from the Engineering Division; Richard Kadel, Physics Division; Othon Monteiro, Accelerator and Fusion Research Division, and Otis Wong, Office of Assessment and Assurance.

The review of Nuclear Science Division's ES&H documentation focused on the Division's system for work planning, hazard identification and risk analysis, establishment of controls, evaluation of work performance, and feedback and improvement to Division management. Prior

to the site visit, Nuclear Science Division provided responses to the MESH questionnaire and supplied supporting documentation. Documents reviewed included the Division's ISM Plan, minutes of the NSD ES&H Committee, completed Project/Facility Safety Review Questionnaires, NSD Activity Hazard Documents (AHDs), completed safety walkthrough sheets and inspection records, the FY03 NSD Self-Assessment Report, and the previous NSD MESH Report (May 2001).

The MESH appraisal was conducted on June 29, 2004. James Symons, Nuclear Science Division Director, and Kathie Hardy, Safety Coordinator, presented an overview of the NSD ES&H organization and program and responded to the MESH team's questions and discussion points.

After the opening meeting, the MESH team toured and interviewed personnel at the following Nuclear Science facilities:

- Heavy Element Nuclear and Radiochemistry Group, B70/203, 209, 210 (Ralf Sudowe)
- Machine Shop, B88 (Bob Shannon)
- 88" Cyclotron, B88/Caves 1, 2, 4A, 4B, 4C, 5 (Dennis Collins)

The objective of the walk-through was to give the team the opportunity to talk to Nuclear Science managers and staff and to observe the type of work being performed, the hazards present in the facilities, and the administrative and engineering controls in place to mitigate workplace hazards.

C. Description of Division

The Nuclear Science Division's principal activity is basic research in theoretical and experimental nuclear physics, including the study of nuclei under extreme conditions, using nucleus as a testing ground for fundamental symmetries, and pursuing new horizons in neutrino properties. NSD has approximately 118 career and term employees and 160 participating guests. A majority of the Division's work is done at B88, home of the 88" Cyclotron. However this may change as the usage of the 88" Cyclotron is currently evolving. The Division also conducts work in Buildings 50, 50A, 70, 70A, 71 and 72. Nuclear Science is organized by six major program groups: Institute for Nuclear and Particle Astrophysics, Low Energy Nuclear Science, Relativistic Nuclear Collisions, 88" Cyclotron, GRETINA, and Nuclear Theory. Most programs are involved in collaborative projects with other divisions at LBNL and/or with national or international industries. The MESH review focused on the NSD site activities; the activities at other non-NSD facilities are beyond the scope of the MESH process.

Hazards that are present in Division work include radioactive materials, lasers, compressed gases, sealed sources, hazardous chemicals, hand and machine tools, and ergonomics. Much of the hazards are related to accelerator work at the 88" Cyclotron. The Division has nine active Activity Hazard Documents (AHDs), twelve Radiation Work Authorizations (RWAs), and three sealed source authorizations.

Nuclear Science has an ES&H Coordinator, a Division-wide Safety Committee, and an 88” Cyclotron Safety Committee to assist in the planning and review of work and associated safety concerns within the Division. The Coordinator is the programmatic lead for ES&H and has the responsibility to develop policies and procedures, manage the Division self-assessment process, develop the ES&H budget, act as the primary ES&H communication point-of-contact within the Division, and serve as a member on both safety committees. The Division and 88” Cyclotron Safety Committees meet quarterly and identify ES&H needs in policy, procedure, equipment and training, perform project reviews of all division work projects, participate in self-assessment activities and root cause analysis, communicate ES&H issues to staff, and provide expert in-house advice on ES&H. The Division ISM Plan commits the following resources to ES&H:

- 0.40 FTE, ES&H Coordinator
- 0.33 FTE, Administrative Assistant
- 1.00 FTE, Radiological Control Technician
- 0.10 FTE, Health Physicist
- 0.20 FTE, Field Support Department Division Liaison

NSD also receives support from EH&S Division professionals as-needed for specific expertise: hazard evaluation, waste management, industrial hygiene consultation, occurrence reporting, and participation in ES&H self-assessment activities.

D. Results of the MESH Appraisal

1. Work Planning

The Division has well established procedures for planning its research work. All NSD project leaders are required to work with the Division’s Safety Coordinator and Division standing committees in the review and approval of their research projects. Work that requires formal authorization (i.e., Radiation Work Authorizations, Activity Hazard Documents, etc.) is transmitted to the EH&S subject matter experts for their review and concurrence. From this planning process, a documented protocol is established for conducting work at the Division.

Noteworthy Practice: Nuclear Science has bi-weekly division-wide meetings and weekly technical staff meetings at the 88” Cyclotron. Safety is a standing agenda item for both of these types of meetings. The regular focus on safety in these relatively frequent meetings demonstrates the priority that the Division has for safety and is an example of integrated safety management in Division activities and operations. These meetings should be documented in the Division ISM plan as methods of communicating safety related information to Division personnel.

Noteworthy Practice: The 88” Cyclotron Program Action Committee continues to be an excellent review committee for beamline work at the facility. The committee not only reviews each research proposal but also provides researchers with useful information on safety training and administrative requirements prior to their performing work at LBNL.

Observation: Relative to other LBNL divisions, Nuclear Science has minimal information about its ES&H program on its website. To communicate essential safety policies and procedures to division personnel, Nuclear Science should consider developing a more robust safety website. At a minimum, the Division should identify its Safety Coordinator and other safety personnel in the organization charts in both the NSD and 88” Cyclotron websites. This will allow NSD individuals who may be “out of the loop” to quickly contact the division safety expert to address their safety issue.

Observation: The Division has active safety committees for the Division and 88” Cyclotron. The committee minutes reviewed by the MESH team shows that important safety issues are being discussed and resolved at these meetings. As stated in its ISM plan, representatives on the safety committees relay the information to their individual groups. To further disseminate safety information, NSD should consider posting the minutes on a NSD safety website and/or communicate significant information in a level-I e-mail.

Observation: Completing a memorandum of understanding (MOU) with the Engineering Division for their matrixed employees was identified in the last MESH review three years ago. The MOU is still recommended to establish clear roles and responsibilities, including training responsibilities, between NSD managers and matrixed employees from the Engineering Division. During the MESH review of the Engineering Division, the Engineering Division Director acknowledged that MOU’s with research divisions were not in place, and he anticipated that they will be complete by July, 2005.

2. Hazard Identification and Risk Analysis

The Division has nine Activity Hazard Documents (AHDs), twelve Radiation Work Authorizations (RWAs), and three Sealed Source Authorizations (SSAs). All of its formal authorizations have been reviewed and updated within the required renewal schedules. For projects at the 88” Cyclotron and other lower hazard research work, NSD utilizes its Project/Facility Safety Review Questionnaire. The Questionnaire is completed by the principal investigator and submitted to the 88” Research Coordinator and/or the Division Safety Coordinator for review and referral to Division review committees.

Noteworthy: The Division has done a commendable job in reviewing and updating both formal authorization projects and lower hazard projects. All projects appear to have been reviewed in a timely manner. Of particular note, the review of lower hazard projects, which has been problematic at other divisions, demonstrates that NSD has a systematic process through its Project/Facility Safety Review Questionnaire and safety committees.

Concern: Although ergonomics has been identified as a significant hazard/risk for the Division, the systematic evaluation of workstations and other ergonomic risks appears to be progressing slowly. The MESH team observed at least a dozen workstations in NSD labs in Building 70 that were not retrofitted with ergonomic furniture or accessories. From a review of the LBNL ergonomic evaluation database, the Division has only 28 requested evaluations entered into the database. Of the requested evaluations, 8

evaluations have been completed, 12 have been assigned, and the remaining 8 are designated as unresolved.

3. Establishment of Controls

From the field inspection of select Nuclear Science facilities, engineering and administrative controls are generally in place and effective in controlling hazards. The facilities visited were clean and orderly. Containment and safety equipment, such as fume hoods, fire extinguishers, and emergency showers and eye wash stations, were all inspected and maintained as required. The lab and shop managers interviewed were knowledgeable of the ES&H systems and controls required by the Division.

Noteworthy Practice: Documentation for the authorized work in B70, labs 203, 209 and 210 (Heavy Element Nuclear and Radiochemistry Group) was extremely well organized and maintained. The principal investigator filed in a single binder his list of personnel, radiation work authorizations, training status of employees, guests and students, including documentation of their on-the-job training (OJT), and all other pertinent safety information affecting work in these labs. The binder was reminiscent of the “Project Notebooks” that were utilized ten years ago. Other LBNL labs should consider resurrecting their Project Notebooks using the format of this research group.

Concern: During the site visit of NSD facilities, the MESH team noted a significant number of cabinets and other equipment that were not seismically braced. The team found unsecured cabinets and equipment racks in four (2, 3, 4a and 4b) of the five experimental caves visited at the 88” Cyclotron. Three of the cabinets could potentially block the exit if they fell over during an earthquake. Several other cabinets in the B70 labs, including a corrosive chemical storage cabinet, also were not braced. The Division should focus on securing cabinets and other large items during this year’s self-assessment inspections.

4. Work Performance

The Nuclear Science Division has an excellent record for performing work safely. There have been no unusual and adverse ES&H incidents that require DOE reporting (i.e., ORPS reports) during the past year. Management of hazardous waste is excellent with no Nonconformance Activity Reports (NCARs) or QA exception reports. All satellite accumulation areas are at 100% compliance. Completion of the Job Hazard Questionnaire (JHQ) and required ES&H training by NSD personnel are at 96% and 92% respectively. The Division has not incurred any recordable injuries or lost workdays for this current fiscal year.

Noteworthy Practice: The Division has eliminated all mixed waste generation from its operations. In fiscal year 2002, NSD generated approximately 40 kilograms (56 liters) of mixed waste. By eliminating and modifying some research activities, the Division was able to achieve zero generation of mixed waste.

Noteworthy Practice: The Chair of the NSD Safety Committee is commended for personally checking the status of JHQ's for all NSD personnel, and contacting supervisors in cases where employees' JHQ's have not been completed. Such action is an example of senior management involvement and commitment to safety at NSD.

Observation: Although the team acknowledges that work in the 88" Cyclotron caves is normally done under unavoidable crowded conditions, researchers should still make every attempt to place equipment in a manner to not block exits. All unused or seldom used equipment should be stored outside of the caves as feasible. It was also noted that to the right of the entrance door to room 161 (high bay area), empty cardboard boxes were blocking the emergency exit plan posted on the wall.

Observation: In Cave 4c, the safety stop wiring on the cave door was badly deteriorated, and parts appeared unconnected with dangling leads. This should be corrected.

Concern: The Division has experienced one Level 1 (minor) and one Level 2 (major) violations of its Radiation Work Authorizations in 2004. The Level 2 violation involved an employee performing radiation work without the required direct supervision or radiation training. Although the relative number of violations is few, the two non-compliances follow the four major violations noted the previous year (2003).

5. Feedback and Improvement

The Division director, line managers, and the Safety Committee participate in safety inspections of NSD workspaces. NSD has two active safety committees that elicit feedback from employees and resolve Division safety issues. One committee is at the 88" Cyclotron and the other is a division-wide committee. The 88" Cyclotron Safety Committee has historically played an important role in reviewing all experiments at the Cyclotron. The division-wide committee, chaired by a former member of the Safety Review Committee, is noted for its proactive stance on safety issues. Safety is incorporated in NSD job descriptions and performance appraisals and is a standing agenda item at the Division's all-hands meetings.

Observation: The inspection sheets provided to the MESH team were primarily from walkthroughs conducted at the 88" Cyclotron. There was no documentation that other NSD facilities are being inspected on a regular basis. This issue was also identified in the 2003 ES&H Self-Assessment Report.

Concern: Although the Division has improved its usage of LCATS to track corrective actions of its ES&H deficiencies, there remain significant inconsistencies in retrieving complete, accurate and up-to-date information on corrective actions. For example, NSD has LCATS entries for only calendar years 2002 and 2004 (there are no 2003 entries). Of the 63 entries in 2002, only 19 corrective actions have been closed out. For the 2004 corrective actions, all 40 entries are for deficiencies discovered and corrected by one

individual at the 88" Cyclotron. There are no entries from other NSD facilities, and no other NSD personnel are identified as the responsible person for completing the corrective actions. Many deficiencies noted in the safety walk-through sheets are also not being transferred into the LCATS database. Moreover, these deficiencies are left as open items in the walk-through sheets. Of the more than 120 deficiencies noted in the walk-through sheets provided to the MESH team, only 55% were listed as completed, pending, or under study. In one case from an inspection conducted on October 28, 2003 at B88-011, only 2 of 17 safety deficiencies were listed as complete. The MESH team acknowledges that some of the deficiencies may have been corrected and not closed out on LCATS or the safety walkthrough sheet, but this again points out to the inconsistencies and incompleteness of the Division's corrective action tracking system. Out-of-date information on safety issues makes it impossible to obtain an accurate snapshot of the overall Division safety status, prioritize existing safety hazards for remediation, determine if older trends in safety incidents have been corrected, and identify new trends in unsafe behavior or accidents.